SPS-5 Construction Report
Trunk Highway 2, Westbound
14 Miles West of Bemidji, Minnesota

Core Sections 270501 to 270509
Supplemental Sections 270559 to 270561

Federal Highway Administration
LTPP Division
North Central Region

Report Prepared By:

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June 21, 1996

BRAUN[SM]
INTERTEC

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Engineers and Scientists Serving the Built and Natural Environments®

June 21, 1996

Mr. Richard C. Ingberg
Regional Engineer
Braun Intertec Corporation
6875 Washington Avenue South
P.O. Box 39108
Minneapolis, MN 55439-0108

Dear Mr. Ingberg:

Enclosed is the Construction Report for the Minnesota SPS-5 project.

If you have any questions about this report please call Ronald Urbach or Benjamin Worel.

Sincerely,

Ronald R. Urbach, CET

Benjamin J. Worel, PE

Attachment:
Report

c: Mr. Monte Symons, FHWA
Mr. John Miller, PCS/Law
Mr. Cameron Kruse, Braun Intertec

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SPS-5 Construction Report
Trunk Highway 2, Westbound
14 Miles West of Bemidji, Minnesota
Sections 270501 to 270509

1.0 Introduction

The SPS-5 experiment is a study of:

- Use of virgin and recycled asphaltic concrete mixes;
- Type of surface preparation (minimum and extensive); and
- Overlay thicknesses of 2 inches and 5 inches.

Minnesota constructed this SPS-5 before the guidelines were published. Because of this, many of the datasheets and data collected are not in the same format as is now expected. The information collected and entered into RIMS is limited. This project is not considered a pilot project even though it was built early in the SHRP project.

1.1 Experiment Cell

This SPS-5 project is located in a wet-freeze environmental zone with fine-grained subgrade soils. The existing asphalt pavement was rated in fair condition by the Minnesota Department of Transportation (Mn/DOT) personnel.

1.2 Summary of Supplemental Sections

There are three supplemental test sections for this project.

- Test section 270559 is considered the standard rehabilitation for Mn/DOT. It consists of a 1 1/2-inch overlay of Type 41 asphaltic concrete surface mix. This mix lift was placed over the existing asphalt pavement.

- Test section 270560 consists of milling the transverse cracks only. The milling consisted of a depth of 4 inches and a width of 10 inches at each of the transverse cracks. After the milling was completed, the milled trench was cleaned with compressed air and filled with a leveling course material (Type 31 asphaltic concrete mix underlying surface 41 mix lifts). After the levelling course had been placed and compacted, a 1 1/2-inch lift of Type 41 asphaltic concrete mix was placed as a surface layer.

- Test section 270561 consists of two different types of mixes. The first asphalt layer has a Type 31 mix placed using a tight blade application procedure. A motor grader was used for placement and than compacted. The final asphalt layer consisted of a 11/2-inch lift of Type 41 asphalt concrete placed with an asphalt paver.

1.3 Project Location

This SPS-5 project is located about 14 miles west of Bemidji, Minnesota, on westbound US-2. Bemidji is about 225 miles northwest of Minneapolis, Minnesota. Attachment A contains a map indicating the locations of Minnesota's GPS and SPS sections including this SPS-5 project. The test sections are located between mileposts 95 and 106.

1.4 Type of Roadway

The existing pavement was constructed and open to traffic in 1970 and consisted of the following.

7 inches of plant mix bituminous
6 inches of class 6 base
6 inches class 4 base
6 inches class 3 base
Sand subgrade

Attachment B contains a project layout for the locations of the test sections built.

There are no edge drains located on this project.

1.5 Traffic Characteristics

The traffic characteristics had a design traffic of 4,900 AADT with 13 percent trucks and 85,000 18K ESALS per year. The estimated total of 18K ESALS in the study lane is 1,615,000. The project was considered for an overlay because of its fair condition rating caused by transverse cracking.

1.6 Known Deviations From Guidelines

There were several deviations from the SPS-5 Guidelines. It should again be noted that the project was construction in 1990 while the Construction Guidelines were still being developed. Attachment C contains the project and section deviation datasheets. The major deviations include:

- A portion of the test sections are on fine-grained soils and other parts are on coarse-grain soils.
- The sampling plan is missing many samples because the SPS-5 guidelines were not available for reference.
- The materials sampled during pre and post construction were tested by the Minnesota Department of Transportation due to the delay of the SPS-5 guidelines. Much of this data should be usable to FHWA.
- There is a small town of Solway, located within the project. The small town is located so that four test sections are located east of town and the remainder of the test sections are located west of town. Because of the small size of the town it was thought that influence of traffic should have very little effect on evaluation of the project.

- The construction datasheets have limited data because guidelines were not developed at the time of construction in 1990.

1.7 Geometry
The geometry of the project is relatively straight and flat.

1.8 Underground Structures Within Test Sections
The test sections have been located as to not have underground structures within the test sections. The underground structures are in the transition zones between test sections.

1.9 Installation of Weather Station
There is not an LTPP weather station required for the SPS-5 projects. There is a national weather station at the Bemidji airport which is approximately 14 miles east of this site.

1.10 Installation of WIM
The weigh-in-motion (WIM) was installed in 1982 by the Mn/DOT personnel. This WIM is located on the west side of Bemidji that is known as the Bemidji bypass at Milepost 115.55. The equipment consists of a bending plate style weigh-in-motion.

1.11 Schedule for Opening of Traffic
The original roadway was open to traffic in 1970. The SPS-5 rehabilitation project was completed and open to traffic in the fall of 1990. There were no permanent lane closures during construction of the SPS-5 rehabilitation project. Traffic was routed around construction equipment and activities.

1.12 General Problems
There was occasionally a light rain which delayed paving. The weather was in the high 70's with relatively no other problems.

1.13 Resident Engineer Information
The Minnesota Department of Transportation project team is listed below.

- Mr. Lloyd Larson, Resident Engineer, (218) 755-2592
- Mr. Bob Kleinschmidt, Project Supervisor, (218) 755-3814
- Mr. Graig Gilbertson, District Materials Engineer, (218) 755-2028

Mn/DOT
Box 490
Bemidji, Minnesota 56601
Fax: (218) 755-4087

The FHWA Regional Engineer for this project is:

- Mr. Richard Ingberg
  Regional Engineer
  6875 Washington Avenue South
  P.O. Box 39108
  Minneapolis, Minnesota 55439-0108
  (612) 942-3066
  (612) 942-3059 Fax

Representatives of the LTPP Regional Office (Braun Intertec Corporation) are listed below.

- Dr. Eugene Skok, Jr., (612) 942-3061
- Mr. Erland Lukanen, (612) 942-3041
- Mr. Ronald Urbach, (612) 942-3055
- Mr. Benjamin Worel, (612) 942-3057

1.14 Materials Sampling and Testing

Preconstruction material sampling was done on the existing pavement layers during June 13-14, 1990. The sampling plan dated March 1990, is included in Attachment D. Mn/DOT personnel performed the sampling. Braun Intertec, Grand Rapids, Minnesota, office did nuclear density testing for Mn/DOT. Samples were sent to Bemidji and Maplewood Mn/DOT laboratories for testing. Sampling datasheets were sent to the North Central Regional office.

Post construction sampling was done on the overlay material October 22, 1990. The cores were taken by Mn/DOT and shipped to the District 2 Bemidji laboratory. The sampling datasheets were sent to the North Central Regional office.

Preconstruction laboratory testing was performed during the fall of 1990, and the winter of 1991. Mn/DOT tested the samples using Minnesota's protocols and reported the results on Mn/DOT forms. Resilient modulus testing was also performed by Mn/DOT on the subgrade and base layers. The data results were sent to the North Central Region on Mn/DOT forms. The data has not been converted to LTPP forms until it is known if the Mn/DOT testing protocols are acceptable to LTPP.

Post-construction laboratory testing (Layout in Attachment E) was performed during the winter of 1991, by Mn/DOT. Mn/DOT tested these asphalt samples using Mn/DOT's protocols and reported the results on Mn/DOT forms. The North Central Region has received these forms and is waiting to convert this data until it is known the data is acceptable to LTPP.

Samples for the Materials Reference Library (MRL) were taken during construction and shipped on September 17, 1990, to the MRL storage facility in Austin, Texas. Samples taken and shipped were four 55-gallon drums of the virgin aggregate, two 55-gallon drums of the recycled asphaltic concrete pavement (RCP) and 22 5-gallon pails of the asphaltic cement used in the mixes. Samples were taken of the asphalt mix, two burlap bags of each of the virgin mixes and one of the recycled mix.

Attachment F contains the letter written to Minnesota requesting information on the test procedures used by Mn/DOT. This information will be needed to determine the use for the data collected by Mn/DOT.

1.15 Contractor Information

The paving contractor representatives are listed below.

- Mr. Dan Surma
- Mr. Bob Surma

Tri-City Paving Incorporated
Little Falls, Minnesota 56345
(612) 632-5439

1.16 Summary of Key Construction Equipment

The following equipment was reported to be used on the SPS-5 in Minnesota. Attachment G includes the list of equipment used by Tri-City Paving.

Loaders
- 1 - Cat 966D
- 2 - Cat 980
- 3 - H90E Hough

Hot Mix Plant
- 1 - Boeing 500 mass Turb w/recycle capabilities
  Rated 500 tons per hour production

Dozers
- 1 - Cat D76

Motor Graders
- 1 - Cat 12G
- 1 - Cat 12F
- 1 - Cat 12E

Brooms
- 2 - Bros Model C - power brooms

Rollers
- 1 - Dynapac Model CC-50A
- 2 - Bros Model SP 54B - rubber tired
- 1 - Pull type 13 wheel (rubber)

Paving Equipment
- 2 - Blawknox PF500
- 1 - CMI Windows elevator

Crusher
- Telsmith 48S
  Cone type processing plant

Milling Equipment
- Cat model PR105 milling machine
- Model RX-40 Barber Greene Dyna Milling Machine

2.0 Project Details

The following are the project details for this project.

- Test section summary of surface preparation and overlay is shown in Table 1.

Table 1. Test Section Summary of Surface Preparation and Overlays

Section Number	Surface Preparation	Mill Depth (inch)	Overlay Thickness (inch)	Type of Overlay Mix
270560*	Mill 4 x 10 inch Transverse Cracks	4 cracks only	1.5	Virgin
270559*	(Tight Blading) Level Course	None	1.5	Virgin
270501	Control	None	None	-
270561*	(Tight Blading) Level Course	None	1.5	Virgin
270507	Intensive	2	5	Virgin
270504	Minimum	None	5	Virgin
270506	Intensive	2	2	Virgin
270505	Minimum	None	2	Virgin
270509	Intensive	2	2	Recycled
270502	Minimum	None	2	Recycled
270508	Intensive	2	5	Recycled
270503	Minimum	None	5	Recycled

* State supplemental test section.

- Test section layout is located in Attachment B.
- Material sampling and testing plan for the existing pavement layers before the overlays are located in Attachment D. This plan was prepared in March, 1990.
- Material sampling and testing plan for the asphalt overlay materials is located in Attachment E. This plan consisted of sampling of the asphalt concrete overlays.
- Attachment H contains a site investigation report prepared by Erland Lukanen.
- Attachment I contains the nomination forms Mn/DOT sent to SHRP.

2.1 Construction Activities

Milling
Milling was required on four of the test sections. The plans prepared by Mn/DOT dated February 22, 1990, indicated that the areas to be milled should include a 50-foot taper at both ends of the test sections, so a full depth 2-inch milling could be performed within the test section. This was done on all test sections except for 270508. Because of the milling plan and actual milling work done, the true thickness of the asphalt layers are in question for the milled sections. The sampling areas were located 25 feet before and after the test section which could cause the samples to be taken in a milling taper area. Table 2 summarizes the areas where the full-depth milling and tapers were performed.

Table 2 Location of Full-Depth Milling and Tapers

Test Section Number	Start of Milling	Start of 2" Milling	Start of Test Section	End of Test Section	End of 2" Milling	End of Milling
270507	365 + 75	365 + 25	365 + 00	360 +00	359 + 75	359 + 25
270506	347 + 75	347 + 25	347 + 00	342 + 00	341 + 75	341 + 25
270509	329 + 25	328 + 75	328 + 50	323 + 50	323 + 25	322 + 75
270508	313 + 50	313 + 00	312 + 75	307 + 75	307 + 75	307 + 25

The milling was performed with a Model RX-40 Barber Green DYNA Milling Machine. After the milling was performed, the roadway was swept and temporary marking tape was placed. The millings were used in the recycled asphaltic concrete mix used on four of the test sections.

Test section 270660, a supplemental test section, required that the transverse cracks be milled 4.0 inches deep and 10.0 inches in width. This milling was completed using a CAT Model PR105 Milling Machine. After the milling was performed, this milled area was filled with a fine-graded asphaltic concrete mix and compacted prior to the overlay.

Asphalt Plant
The asphaltic concrete mix was produced in a Boeing Model 500 Mass Turb Hot Mix Plant. This plant has recycling capabilities and is rated at 500 tons per hour.

Asphalt Paving
The asphaltic concrete was placed using a Blau-Knox PF 500 paver. The asphaltic mix was dumped on the roadway and a CMI Windrow elevator was used to place the material into the paver. By using the elevator, this eliminated the paver from stopping for each load of mix, providing a smoother pavement. After the mix was placed, a Model CC 50A DYNAPAC compactor was used to compact the mix. Two BROS Model SP54B and one pull-type 13-wheel rubber-tired pneumatic roller was used to compact the mix.

A tackcoat was placed before each of the levelling and overlay lifts were placed.

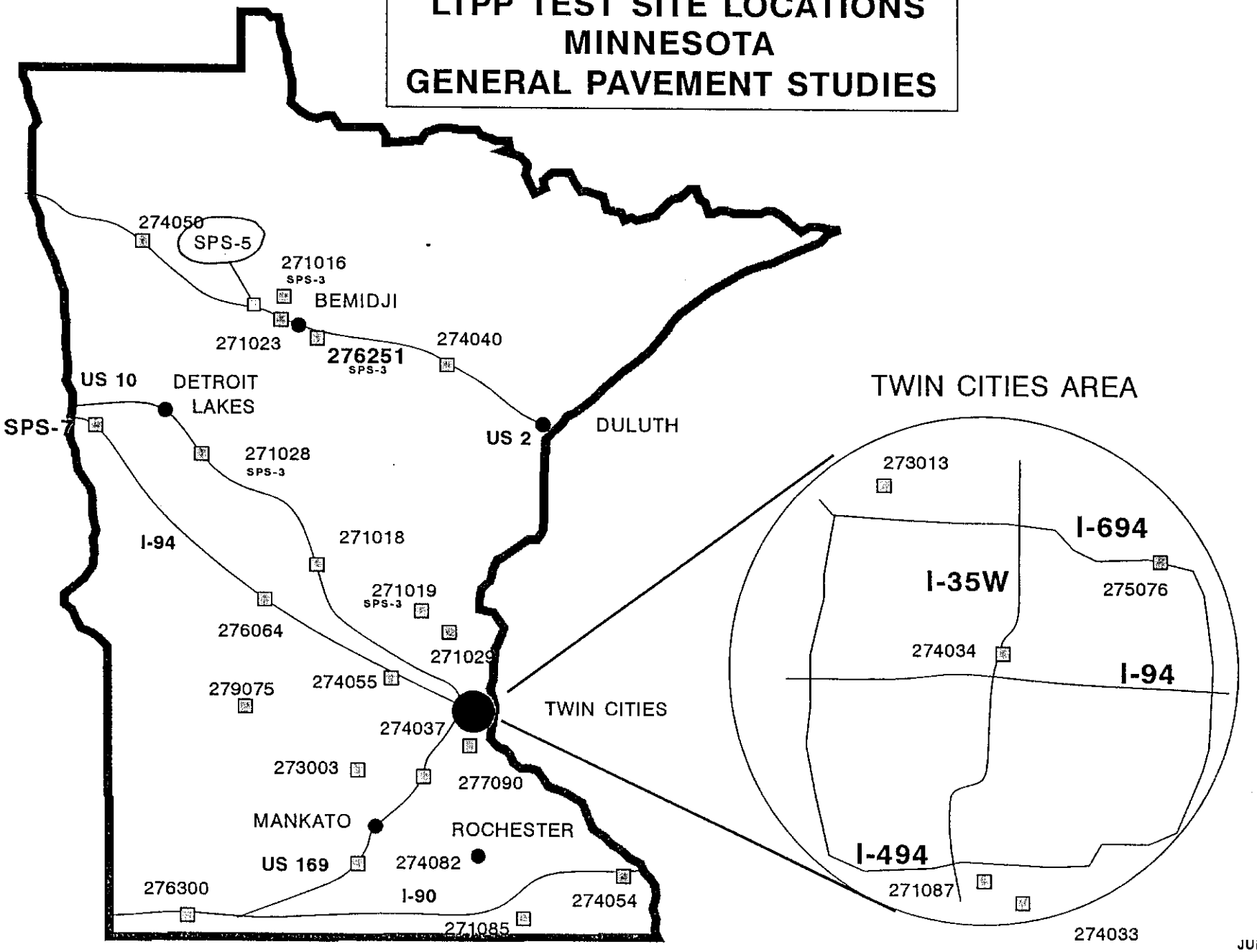
3.0 Initial Performance

The SPS-5 sections are performing as expected as of May, 1995. No sections have had need of any rehabilitation or maintenance since they were constructed in 1990. The control section 270501 may need some work in the upcoming future. All test sections are still active sections.

Attachment A

Minnesota GPS/SPS Site Location Map

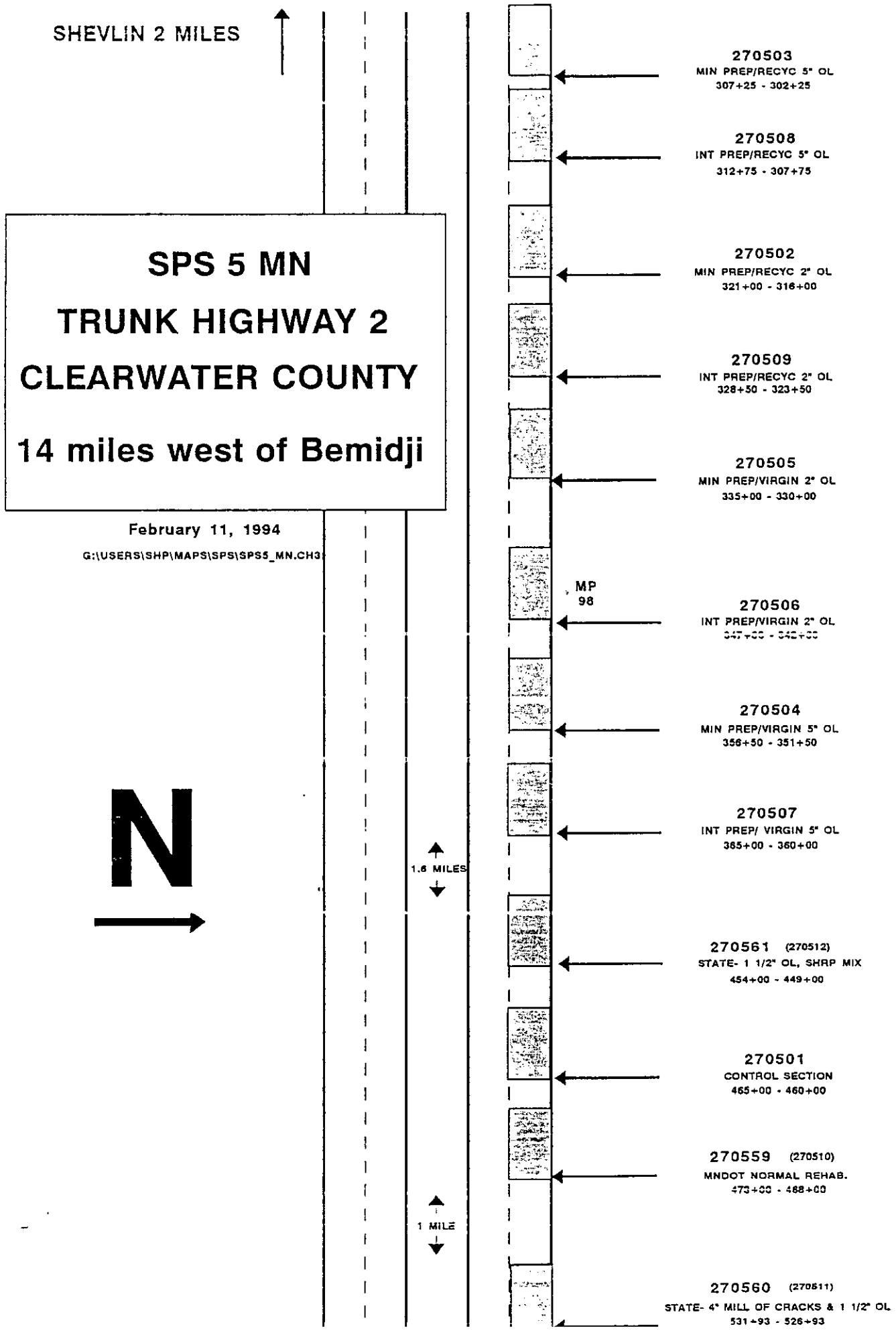
LTPP TEST SITE LOCATIONS
MINNESOTA
GENERAL PAVEMENT STUDIES



JUNE 1992

Attachment B

Test Section Layout Map


SHEVLIN 2 MILES
SPS 5 MN
TRUNK HIGHWAY 2
CLEARWATER COUNTY
14 miles west of Bemidji
February 11, 1994
G:\USERS\SHP\MAPS\SPS\SPS5_MN.CH3
N
1.6 MILES
1 MILE
MP 98
270503
MIN PREP/RECYC 5" OL
307+25 - 302+25
270508
INT PREP/RECYC 5" OL
312+75 - 307+75
270502
MIN PREP/RECYC 2" OL
321+00 - 316+00
270509
INT PREP/RECYC 2" OL
328+50 - 323+50
270505
MIN PREP/VIRGIN 2" OL
335+00 - 330+00
270506
INT PREP/VIRGIN 2" OL
270504
MIN PREP/VIRGIN 5" OL
356+50 - 351+50
270507
INT PREP/ VIRGIN 5" OL
365+00 - 360+00
270561 (270512)
STATE- 1 1/2" OL, SHRP MIX
454+00 - 449+00
270501
CONTROL SECTION
465+00 - 460+00
270559 (270510)
MNDOT NORMAL REHAB.
270560 (270511)
STATE- 4" MILL OF CRACKS & 1 1/2" OL
531+93 - 526+93

Attachment C

Deviation Report Forms

LTPP SPS-5 Project Deviation Report Project Summary Sheet	State Code Project Code	0	5	2 0	7 0

Project Classification Information

SPS Experiment Number: SPS-5	State or Province: Minnesota
LTPP Region:	☐ North Atlantic ■ North Central ☐ Southern ☐ Western
Climate Zone:	☐ Dry-Freeze ☐ Dry-No Freeze ■ Wet-Freeze ☐ Wet-No Freeze
Subgrade Classification:	■ Fine Grain ■ Coarse Grain ☐ Active (SPS-8 Only)
Project Experiment Classification Designation (SPS 1, 2 and 8): None	
Construction Start Date: 7/1/90 (Asphalt Overlay 9/6/90)	Construction End Date: 09/01/90
FHWA Incentive Funds Provided to Agency for this Project:	■ Yes ☐ No

Deviation Summary

Site Location Deviations:	☐ No Deviations ■ Minor Deviations ☐ Significant Deviations
Construction Deviations:	■ No Deviations ☐ Minor Deviations ☐ Significant Deviations

Data Collection and Processing Status Summary

Inventory Data (SPS 5,6,7,9):	☐ Complete Submission ■ Incomplete ☐ Data Not Available
Materials Data:	☐ All Scheduled Samples Obtained and Tested ■ Incomplete
Construction Data:	☐ All Required Data Obtained ■ Incomplete/Missing Data Elements
Historical Traffic Data:	■ All Required Historical Estimates Submitted (SPS 5,6,7,9) ☐ Required Estimates Not Submitted
Traffic Monitoring Equipment: Site Related	☐ WIM Installed On-Site ☐ AVC Installed On-Site ☐ ATR Installed On-Site ■ No Equipment Installed
Traffic Monitoring:	☐ Preferred ☐ Continuous ☐ Minimum ☐ Below Minimum ■ Site Related
Traffic Monitoring Data:	■ Monitoring Data Submitted ☐ No Monitoring Data Submitted
FWD Measurements:	■ Preconstruction Tests Performed ☐ Construction Tests Performed ■ Post-construction Tests Performed
Profile Measurements:	■ Preconstruction Tests Performed ■ Post-Construction Tests Performed
Distress Measurements:	■ Preconstruction Tests Performed ■ Post-Construction Tests Performed
Maint. & Rehab. Data:	■ Complete Submission ☐ Incomplete ☐ Data Not Available
Friction Data:	■ Complete Submission ☐ Incomplete ☐ Data Not Available

Report Status

Materials Sampling and Test Plan:	■ Document Prepared ☐ Final Submitted to FHWA
Construction Report:	■ Document Prepared ☐ Final Submitted to FHWA
AWS: (SPS 1, 2, & 8) None	☐ AWS Installed ☐ AWS Installation Report Submitted to FHWA

Preparer Benjamin Worel

Date 04/17/96

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LTPP SPS-5 Project Deviation Report Site Location Guidelines Deviations	State Code 2 . 7 Project Code 0 5 0 0

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s): (Specify) _____

Site Location Guideline Deviation Comments

The project is located on two different subgrade soil types as shown in Mn/DOT's field boring logs. The east half (approximately) of the project is on coarse-grained soils and the west half is on fine-grained soils. The coarse-grained soils are predominantly poorly graded fine sands to loamy fine sands. The fine-grained sands are predominantly loamy and sandy clays.

There is a small town of Solway located within the project. The small town is located so that four test sections are located east of town and the remainder of the test sections are located to the west of town. Because of the size of the town it has little influence on the project.

WIM location is site related located at Milepost 115.55 on the Bemidji bypass, 9.55 miles from the most easterly test section.

Preparer Benjamin Worel

Date 4/17/96

LTPP SPS-5 Project Deviation Report
Construction Guidelines Deviations

State Code 2 . 7
Project Code 0 5 0 0

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s): (Specify) _____

Construction Guidelines Deviation Comments

The SPS-5 construction datasheets were not available during construction so limited data was collected. The data collection guide is dated October, 1990, and the project was completed September 1, 1990. Attempts were made to collect this data but it was not documented and Mn/DOT staff could not help fill in the details. Mn/DOT did give us milling depths and rod and level thickness measurements on their own forms. Some limited data was also given on the mix designs of the asphalt overlays on Mn/DOT forms. This data will need to be converted to LTPP forms since we do not expect any additional data from the state.

No additional state help is expected for these construction data sheets. A final review of the data should be done to fill in what information we can.

The pavement thickness in the milled section transition areas may not represent the true section thickness by the asphalt cores taken. Paragraph 2.1 construction activities cover this possible deviation along with Table 2 which shows the stationing of the milling and test sections. Further investigation into this deviation may be necessary with possible additional full-depth coring.

Preparer Benjamin Worel

Date 4/17/96

g:\wpfiles\becky\ron.u\96constr.rep\mncon.dev

LTPP SPS-5 Project Deviation Report
Data Collection and
Materials Sampling and Testing Deviations

State Code 27
Project Code 0500

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s): (Specify) _____

Data Collection and Materials Sampling and Testing Deviation Comments

The material sampling (Field_Set=1) is complete.

The testing of the materials sampling (Field Set =1,2) was done by Mn/DOT. The results are given on Mn/DOT forms and have not been converted. We are not sure of the test procedures used to get these results so we are requesting the test procedures from Mr. Fred Maurer (Mn/DOT LTPP contact) before any any additional work is done. Resilient modulus tests were performed by the agency using agency procedures not compatible to LTPP protocol. PCS/Law has been contacted to aid in this process.

Preparer Benjamin Worel

Date 4/17/96

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LTPP SPS-5 Project Deviation Report
Other Deviations

State Code 27
Project Code 0 5 0 0

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s): (Specify) _____

Other Deviation Comments

Inventory data on the existing asphalt pavement is limited. Much of the data was not available to complete these data sheets from the state. No additional inventory information is expected.

This project was built before the documentation and the datasheets were released for use during construction. Due to this fact, much of the information was not collected or was collected by other methods.

Preparer Benjamin Worel

Date 4/17/96

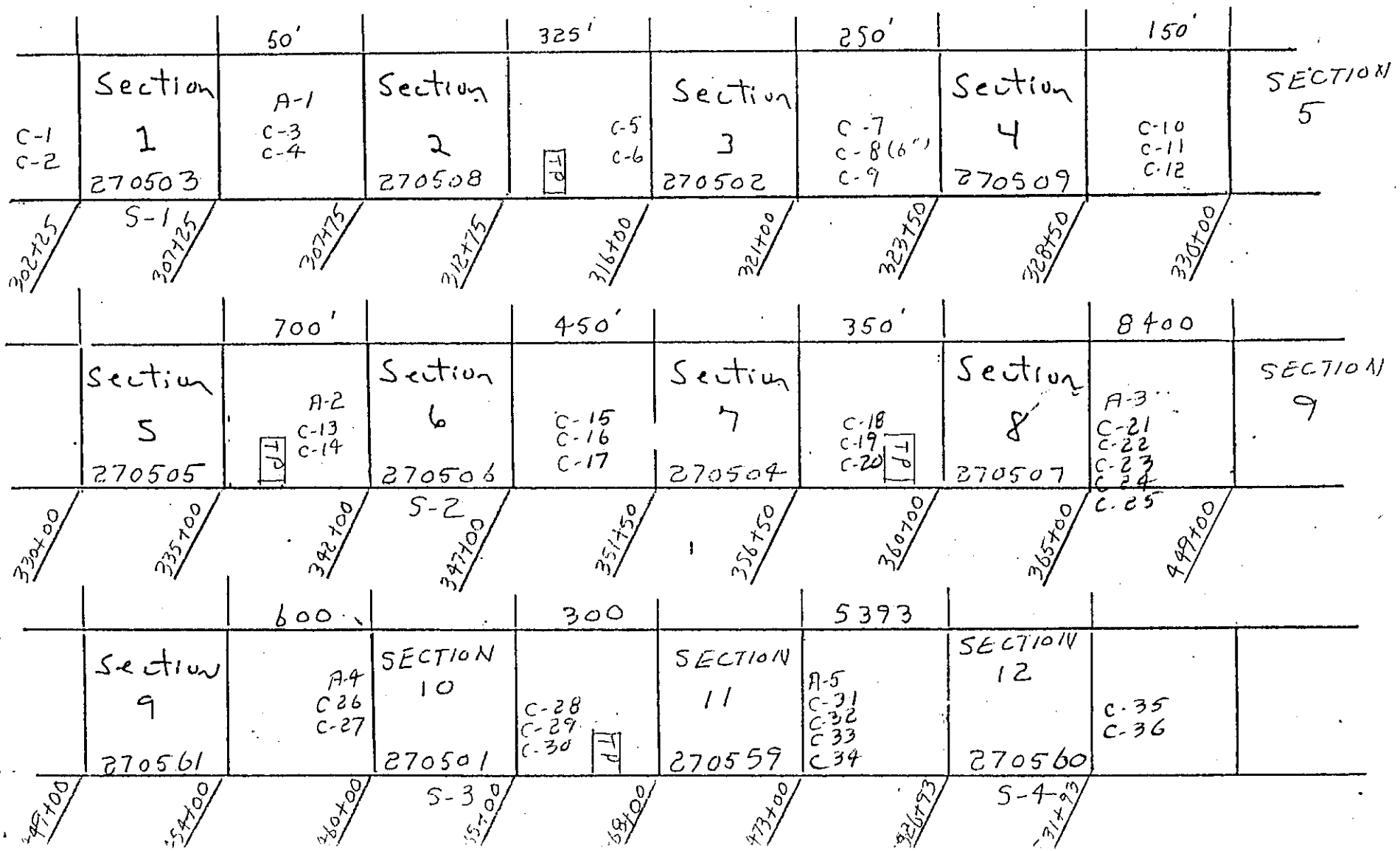
Attachment D

Pre Construction Sampling and Testing Plan

SPS 5
14 MILES WEST OF BEMIDJI MN
WESTBOUND TH 2
PRE CONSTRUCTION
SAMPLING AND TESTING
← TRAFFIC FLOW

UPDATED 2-14-96 RJ

According To March 29, 1990 sampling plan.



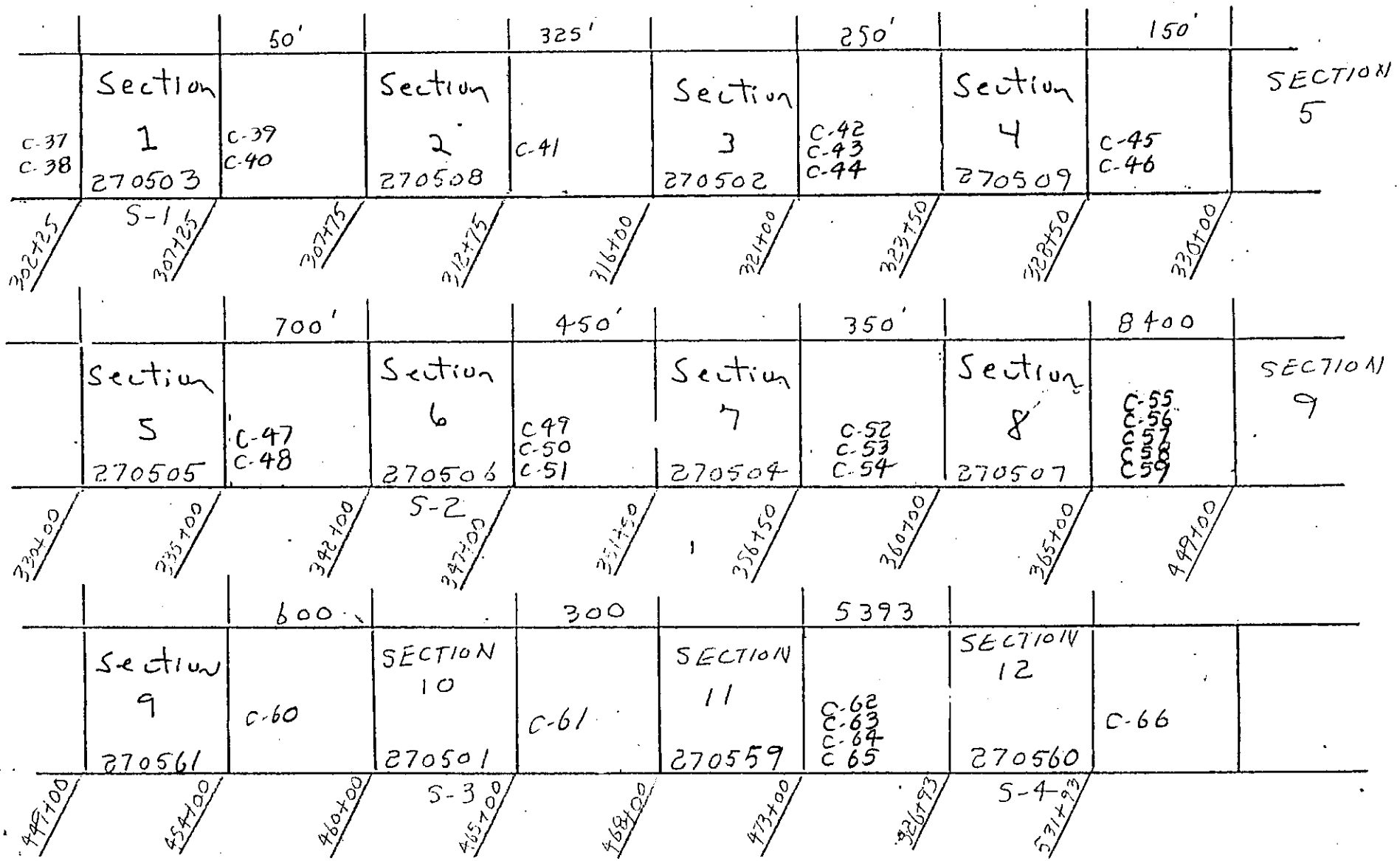
Attachment E

Post Construction Sampling and Testing Plan

SPS 5
14 MILES WEST OF BEMIDJI MN
WESTBOUND TH 2
POST CONSTRUCTION
SAMPLING AND TESTING
← TRAFFIC FLOW

UPDATED 2-14-96 RH

According To March 29, 1990 sampling plan.



Attachment F

Letter to Fred Maurer Requesting Test Procedures

BRAUN
INTERTEC

Memorandum

To:	Fred Maurer	Mn/DOT
CC:	Erland Lukanen	Braun Intertec
	Richard Ingberg	FHWA-LTPP
From:	Benjamin Worel	
Re:	SPS-5 Testing Methods	
Date:	May 2, 1996	

We are currently evaluating the SPS-5 testing data received from Minnesota and its uniformity to the data in the database. We would like to know the test methods used by Minnesota in the fall of 1990 and winter of 1991 to obtain the test results received from Minnesota labs. The next two pages give a listing of the tests done (Appendix E.2: Protocols for SPS Laboratory Tests, dated February 1994). I believe we have received results for all the tests (marked with a -) except for some of the unbound granular base/subbase and subgrade tests and the asphalt cement tests (marked these with a *). I still would like the procedures for the * tests unless Minnesota does not run that test.

Please include the AASHTO or ASTM procedure used for each of the tests marked or the procedure Minnesota has developed to complete the test.

If you require any additional information please feel free to give me a call at 612.942.3057.

g:\users\bjw\sps5mn.bjw

APPENDIX E.2: PROTOCOLS FOR SPS LABORATORY TESTS

This Appendix contains protocols that are required for Specific Pavement Studies (SPS) laboratory testing. Most of the protocols are modifications of existing AASHTO and ASTM standards. The protocols provide specific directions for performing the tests when the tests are done for the LTPP program. In a few instances, neither AASHTO nor ASTM provides a suitable procedure and therefore a "stand alone" protocol has been developed (for example, P01). The protocol and the corresponding AASHTO or ASTM procedure (if applicable) are to be rigorously followed when testing is to be performed for the LTPP program. The laboratory test data sheets in this appendix are for reference only. Reproducible forms are available in Appendix C.2 of this Guide.

Please note that some protocols in this appendix contain the phrase "TO BE TRANSMITTED AT A LATER DATE". These protocols (and their appropriate data sheets) are in various stages of development and not available at this time (February, 1994). The following is a list of the protocols included in this Appendix and a summary of the availability of each protocol to be used in the SPS experiments.

PROTOCOL	LABORATORY TEST TITLE	TEST DESIGNATION(1)	APPROXIMATE AVAILABILITY(2)
	ASPHALTIC CONCRETE		
P01	Core Examination and Thickness	AC01	X
P02	Determination of Bulk Specific Gravity	AC02	X
P03	Determination of Maximum Specific Gravity	AC03	X
P04	Determination of Asphalt Content (Extraction)	AC04	X
P05	Moisture Susceptibility	AC05	X
P06	Creep Compliance	AC06	X
~~P07~~	~~Determination of the Resilient Modulus~~	AC07	X
	EXTRACTED AGGREGATE		
P11	Specific Gravity of Coarse Aggregate	AG01	X
P12	Specific Gravity of Fine Aggregate	AG02	X
P14	Gradation of Aggregate	AG04	X
~~P14A~~	~~Fine Aggregate Particle Shape Test~~	AG05	X
	ASPHALT CEMENT		
P21	Absorption Recovery	AE01	X
P22	Penetration at 77°F and 115°F	AE02	X
P23	Specific Gravity at 60°F	AE03	X
P24	Viscosity at 77°F	AE04	X
P25	Viscosity at 140°F and 275°F	AE05	X
	TREATED BASE/SUBBASE MATERIALS ⇒ NONE		
P31	Type and Classification of Material and Type of Treatment	TB01	X
P32	Unconfined Compressive Strength of Treated Base/Subbase	TB02	X
P33	Determination of Resilient Modulus of Treated Base/Subbase	TB03	X

PROTOCOL	LABORATORY TEST TITLE	TEST DESIGNATION(1)	APPROXIMATE AVAILABILITY(2)
(Continued)			
	UNBOUND GRANULAR BASE/SUBBASE AND SUBGRADE		
P41	Particle Size of Granular Base/Subbase	UG01	X
P41	Sieve Analysis (Washed) of Granular Base/Subbase	UG02	X
P42	Hydrometer Analysis (to 0.001 mm)	SS02	X
P43	Determination of Atterberg Limits	UG04, SS03	X
P44	Moisture/Density Relations	UG05	X
~~P46~~	~~Determination of Resilient Modulus~~	UG07, SS07	X
P47	Classification of Granular Base/Subbase	UG08	X
P48	Permeability of Granular Base/Subbase	UG09	X
P49	Determination of the Natural Moisture Content	UG10, SS09	X
P51	Sieve Analysis of Subgrade Soils	SS01	X
P51A	Dry Sieve Analysis of Subgrade Soils	SS01	X
P52	Classification/Type of Subgrade Soils	SS04	X
P54	Unconfined Compressive Strength of Subgrade Soils	SS10	X
P55	Moisture-Density Relations	SS05	X
P56	Density of Subgrade Soils	SS08	X
P57	Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter	SS11	X
P60	Expansion Index	SS12	X
	PORTLAND CEMENT CONCRETE ⇒ NONE		
P61	Determination of the Compressive Strength of In-Place Concrete	PC01	X
P62	Determination of the Splitting Tensile Strength of In-Place Concrete	PC02	X
P63	Coefficient of Thermal Expansion	PC03	A
P64	Determination of the Static Elastic Modulus of In-Place Concrete	PC04	X
P65	Density of PCC	PC05	X
P66	Visual Examination and Length Measurement of PCC Cores	PC06	X
P67	Interface Bond Strength	PC07	X
P68	Air Content of Hardened Concrete	PC08	X
P69	Flexural Strength	PC09	X

NOTE: (1) Explanation of Test Designation Numbers
- AC -- Asphaltic Concrete
- AG -- Extracted Aggregate from Asphalt Concrete
- AE -- Asphalt Cement
- TB -- Treated (Bound/Stabilized) Base/Subbase
- UG -- Unbound Granular Base/Subbase
- SS -- Subgrade Soil
- PC -- Portland Cement Concrete

(2) X - protocol and data sheet are available in this Appendix.
A - protocol and data sheet are under review. Currently this protocol is under development.

Attachment G

Tri-City Construction Equipment List

- Hot Mix
- Seal Coating
- Roadways
- eways
- Dust Control
- Sand & Gravel

TRI-CITY PAVING INC.

BOX 326 • LITTLE FALLS, MINNESOTA 56345

PHONE
632-5435 or 251-1818

REDI-M
CONCR

FREE ENGINEE
ESTIMATE

TRI-CITY PAVING, INC.

Equipment Information 1990
Proposed Euipment to be used on S.P. ~~0413-24~~ 0406-40

Loaders

1 - Cat 966D
2 - Cat 980
3 - H90E Hough

Hot Mix Plant

1 - Boeing 500 mass Turb w/recycle capibilities
Rated 500 ton per hour production

Dozers

1 - Cat D76

Motor Graders

1 - Cat 12G
1 - Cat 12F
1 - Cat 12E

Brooms

2 - Broce Model C - power brooms

Rollers

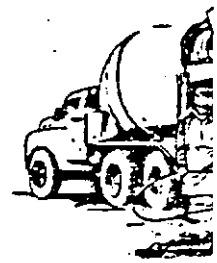
1 - Dynapac Model CC-50A
2 - Bros Model SP 54B - rubber tired
1 - Pull type 13 wheel (rubber)

Pavers

2 - Blawknox PF500
1 - CMI Windrow elevator

Crusher

1 - Telsmith 48S
Cone type processing plant



Attachment H

Minnesota SPS-5 Site Investigation Report

An expansion of
MIDWEST PAVEMENT MANAGEMENT, INC.

1404 Concordia Avenue, St. Paul, MN 55104 — 612 / 644-2996
FAX — 612 / 644-1045

BRAUN
PAVEMENT TECHNOLOGIES
Incorporated

Quality Services Since

C.G. Kruse, P.E., President
Eugene L. Skok, Jr., Ph.D.
Director of Research
Erland Lukanen, P.E.
Director of Engineering
Robert L. Orthmeyer, P.E.
General Manager

December 15, 1989

MEMO TO: Dick Ingberg

FROM: Gene Skok Gene Skok

RE: SPS-5 Report Project on TH 2 Westbound Lane of Bemidji

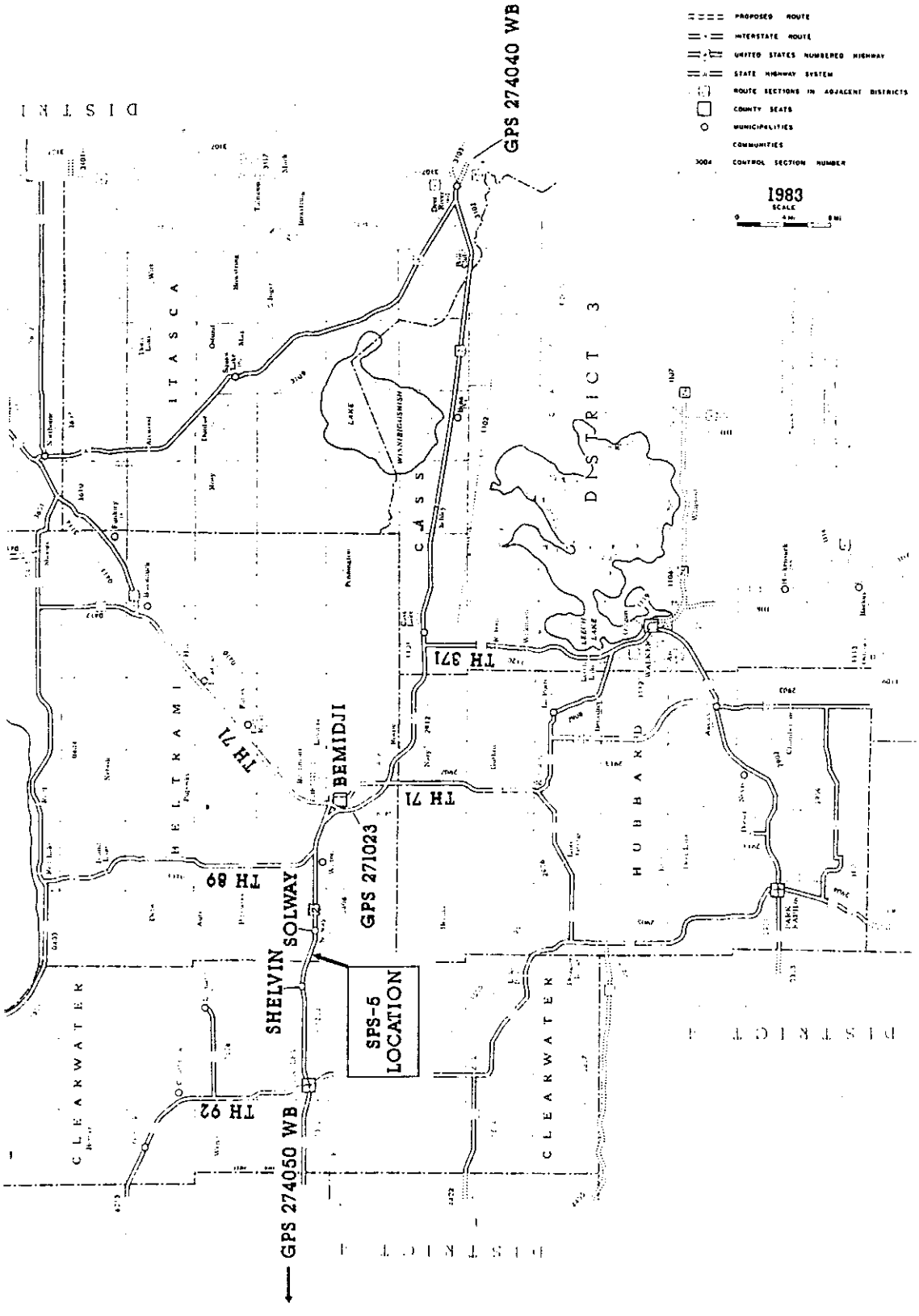
Attached is Luke's report on the SPS-5 project in northern Minnesota. We will keep it in the project files and send a copy to Amir and Gary Elkins.

cc: Amir Hanna
cc: Gary Elkins

MINNESOTA SPS-5 SITE INVESTIGATION
TH 2 NEAR BEMIDJI

MINNESOTA
DEPARTMENT OF TRANSPORTATION

DISTRICT 2



INTRODUCTION

Minnesota offered a potential site for the Special Pavement Study (SPS) for Rehabilitation of Asphaltic Concrete Pavement (SPS-5). This is a part of the Strategic Highway Research Program (SHRP) Long Term Pavement Performance (LTPP) study.

Minnesota located a project on Trunk Highway 2 about 15 miles west of Bemidji that will satisfy the requirements for an SPS-5. The RCOC conducted a preliminary site visit in October. The purpose of the visit was to review the site information and determine if there were enough potential sections available for a SPS-5 site and to lay out the sections in the field.

An initial meeting was held with District 2 staff at the district office. The purpose of the meeting was to review the purpose of SHRP and SPS with the staff, review the project and select potential locations for sections. Ten section locations were identified while inspecting the plans and profile for the project. These sections were then located and inspected in the field.

This report describes the project, its location, and suitability with regard to the controlling factors used for the selection of the sites.

Location maps, section diagrams, and other support graphics are at the end of the report. A copy of the draft "SPS-5 CANDIDATE PROJECT NOMINATION AND INFORMATION FORMS" are also included.

PROJECT DESCRIPTION

Climatic zone

The project is located in northern Minnesota on Trunk Highway 2 about 10 miles west of Bemidji. (A general location sketch in included in the back.) This puts the project into the wet freeze category. The annual rainfall at Bemidji is about 24 inches per year. The depth of frost under the roadway used for design purposes was 6.5 feet. The actual depth of frost penetration can vary somewhat from year to year. Northern Minnesota is one of the coldest areas in the continent United States.

Project location

The project of interest is in the westbound lane of TH 2 between mileposts 95 and 106. Significant items regarding the project location are:

- TH 2 is the major east west highway crossing northern Minnesota. It connects the agricultural areas of northwestern Minnesota and northern North Dakota with the port of Duluth. It is the predominant truck route for hauling grain to Duluth. The heavy haul is in the eastbound direction. There is however, enough loading in the westbound direction to qualify at the minimum KESAL per year value.

- There are no General Pavement Studies (GPS) sections within the project limits. However, there is a GPS section at milepost 114 in the east bound lane. There are two other GPS sections on TH 2 in Minnesota, one about 100 miles to the east and one about 40 miles to the west. (GPS 274040 and 274050 respectively). There is also GPS 271016 on TH 71 just north of TH 2 near Bemidji.

- A permanent Weigh-in-Motion station has been installed in both lanes of TH 2 just west of MP 116. The station has been in operation for about 4 years. A separate piezo WIM is being proposed to be installed within the project limits because of the potential traffic changes between the permanent WIM station and the SPS-5 site.

- The limits of the construction project is Shevlin to Wilton.

Subgrade Soils

The east half (approximately) of the project is on coarse grained soils and the west half is on fine grained soils. The coarse grained soils are predominately poorly graded fine sands to loamy fine sands. The fine grained soils are predominately loamy and sandy clays.

The field borings results are as follows:

Station 466+00 8' Lt. W.B. C/L.
0.0 - 7" Bit.
7" - 1.8 LS&G BWN
1.8 - 2.2 SL BWN
2.2 - 5.0 CL GR VERY FIRM

Station 351+00 8' Lt. W.B.L. C/L
0.0 - 7" BIT.
7" - 1.8 LS&G BWN
1.8 - 3.0 CL GR
3.0 - 3.6 CL-C GR VERY FIRM
3.6 - 5.0 C GR BWN VERY FIRM

Station 329+00 7' Lt. W.B.L. C/L
0.0 - 7" BIT.
7" - 3.7 LS&G BWN
3.7 - 5.0 LCS BWN

Station 314+00 7' Lt. W.B.L. C/L
0.0 - 7" BIT.
7" - 1.7 LS&G BWN
1.7 - 2.2 CL BWN MOIST
2.2 - 4.0 CL-C GR VERY FIRM
4.0 - 5.0 CL GR

Station 312+96 7' Lt. W.B.L. C/L
0.0 - 7" BIT.
7" - 1.7 LS&G BWN
1.7 - 2.7 CL BWN
2.7 - 4.5 LS BWN
4.5 - 5.0 LS&G BWN

Pavement Section

The pavement sections shown in the plans are as follows:

	fine grained	coarse grained
wear	1.5 inches 2341	1.5 inches 2341
binder	2.0 inches 2341	2.0 inches 2341
bit. base	3.5 inches 2331	3.5 inches 2331
cr. stone	6.0 inches cl.6	6.0 inches cl.6
agg. subbase	12.0 inches cl.4	1.5 inches cl. 5
		12.0 inches select granular
S.N.	4.56	3.69

Note that the auger borings show agreement with the plan thicknesses for the total asphalt thickness but the aggregate base thickness found in the borings are less than the 18 inches shown in the plans. The top of subgrade should have been at 2.1 feet but was found in the borings to be between 1.7 and 1.8 feet. If the aggregate base material is of the 0.14 coefficient quality, the

total SN will be about the same as the section shown on the plans. The boring at station 329+00 was near a culvert and shows the presence of granular bedding. The closest section ends at station 328+50 and should be out of the taper (see culvert detail and culvert treatment discussion).

The structural coefficients used to calculate the SN for the cross section shown in the plans are 0.44 for the wear, 0.36 for the binder and bit. base, 0.14 for the cr. stone and 0.09 for the subbase. No credit was given to the select granular in the coarse grained soil since it is essentially the same as the subgrade. The section used in the area with fine grained soils fits within the 0.8 to 1.2 of required SN for a reasonable range of soil strengths. A plot of the required SN for a range of soil strength and confidence levels is included. The strength of the soil is not known at this time. An assumed level of 8000 psi would be a reasonable guess for now. The required SN for a 0.95 confidence level and 8000 psi soil is 4.87. The level of confidence used in the design equation can stretch the limits a bit, particularly with a confidence of 50% used in the design thickness determination.

Subgrade Construction

The embankment construction procedure used by Mn/DOT is to remove and replace all material to a depth of about 5 or 6 feet below grade. The subgrade excavation is termed a compaction subcut. It is used to minimize differential frost heave by blending and compacting a uniform soil in the embankment. It also is used to provide a well compacted embankment on which to construct a pavement. The densities are usually specified to be 100% of T-99 standard proctor in the upper three feet of the embankment. Cuts and shallow fills are treated by this procedure. A compaction subcut was used on this project. Normally, the A and B horizon soils are removed and the C horizon soils removed to a specified depth below the final grade. The C horizon soils are placed back in the embankment in thin (normally 6 inch) compaction lifts. Additional materials as needed are obtained from ditch cuts or borrow pits.

Culvert Treatments

The bedding treatment used for the culverts on this project called for a select granular material to be placed from the bottom of the bedding, tapering up to the elevation of the centerline of the culvert at the rate of 20 to 1. A sketch of the treatment detail is included at the end of this report. This limits the placement of the sections. They cannot begin or end near a culvert or else the select granular will exist under the pavement section. Sections A and B had to be moved together to avoid the potential of overlapping the granular fill.

SECTIONS

Ten sections were selected, located and marked in the field. Table 1 lists the section stationing. Table 1 also lists the suggested treatments for each section. Several of the sections could not be overlaid with 5 in. of asphalt because of grading restrictions caused by lawns along side of the road. The grading restrictions, along with the thickness tapers, limits the flexibility of where the treatment can be located.

Table 1 also contains a summary of the condition of each of the sections. The common distresses are transverse cracks, bleeding, weathering, and a small amount of alligator cracking. There is some variation in the distresses from section to section. We do not have the ability to adjust the treatments according to condition, nor do we want to do that.

Other available section locations

There are six additional locations available within the limits of the fine grained soil that do not have culverts or cut-fill transitions. These are as follows:

Stationing	Cut or fill
375+00 to 380+50	Shallow fill (0 - 8')
401+00 to 407+00	1' - 2' cut
410+00 to 415+00	1' - 2' cut
418+50 to 423+50	3' - 7' fill
449+55 to 455+00	at grade to 2' fill
477+00 to 482+50	3' - 4' fill

Within the limits of the coarse grained soil, there are possible locations available for 17 sections. If there is an interest to evaluate any sections in the coarse grained soils, there is an opportunity for that also.

State sections

Two sections are presently proposed by the state to evaluate the treatment of severe transverse cracks. One section is between stations 528+00 and 532+00. This section will receive a crack repair treatment, likely a mill and patch type of repair. The second is between stations 538+00 and 542+00 (400 feet) which will get the normal tight blading and overlay treatment. The pavement in this area has a higher amount of severe transverse cracks. Treatment of transverse cracks is of particular interest to Minnesota because of the roughness that is due to the dip that forms at the crack. The roughness is often corrected by an overlay.

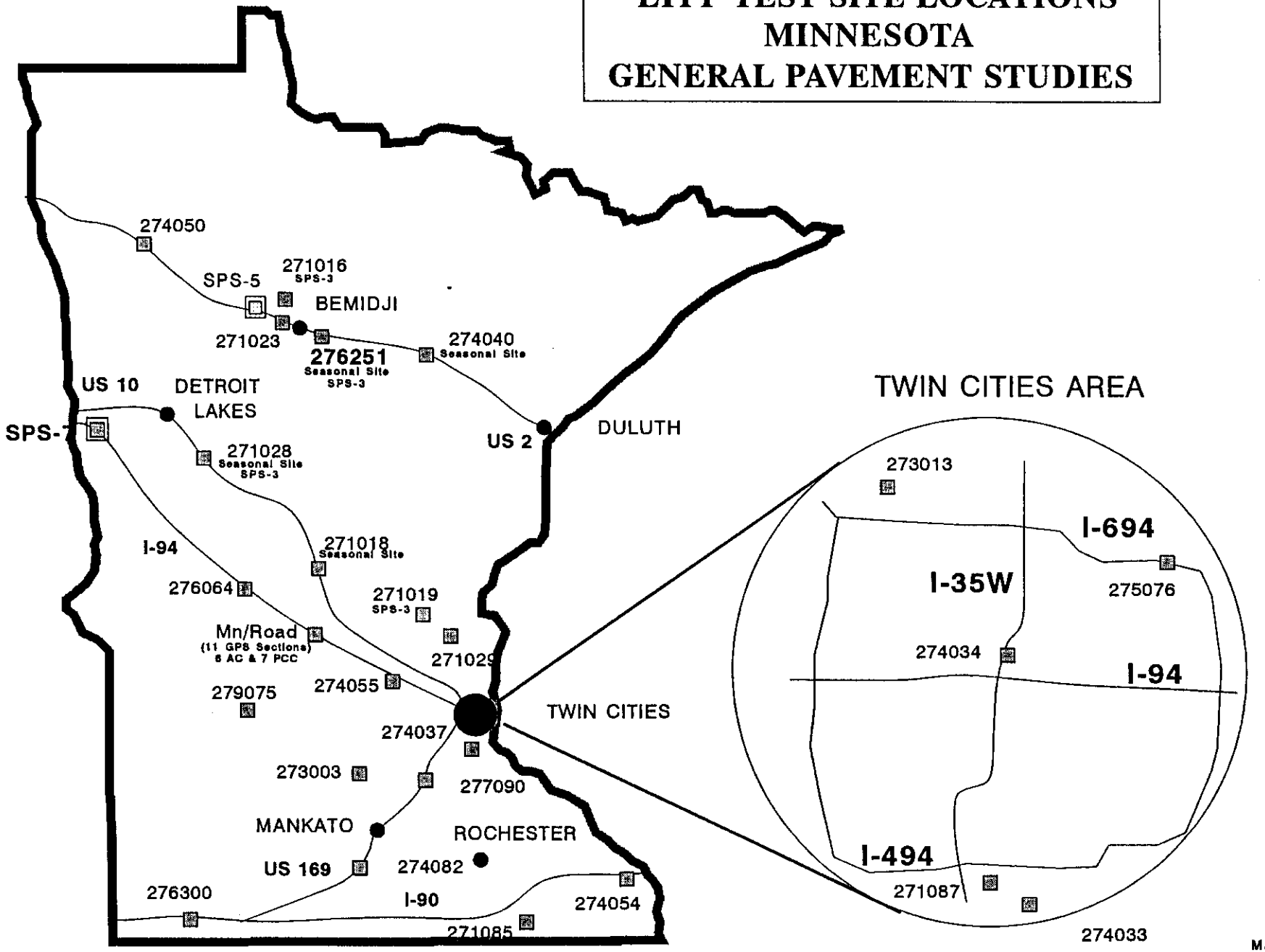
Other data available not yet received

Mn/DOT has historical condition data consisting of Mays Meter measurements, condition data consisting of surface distress surveys

at sample areas within the project bounds and deflection data. The deflection data may have been obtained with a Dynatest FWD, a Model 2000 Road Rater, Benkelman beam or all three. Rut depth and profile measurments should also be available. These were obtained with the South Dakota profile built by Mn/DOT with three sensors. One sensor is located over the center of each wheelpath and the third sensor is located between the wheelpaths. The rut depth is related to how high the between wheelpath readings are over the line between wheelpaths.

The other information that is expected to be requested for the SPS-5 site should be the same as the inventory data requested for the GPS sections.

LTPP TEST SITE LOCATIONS
MINNESOTA
GENERAL PAVEMENT STUDIES



May 1994

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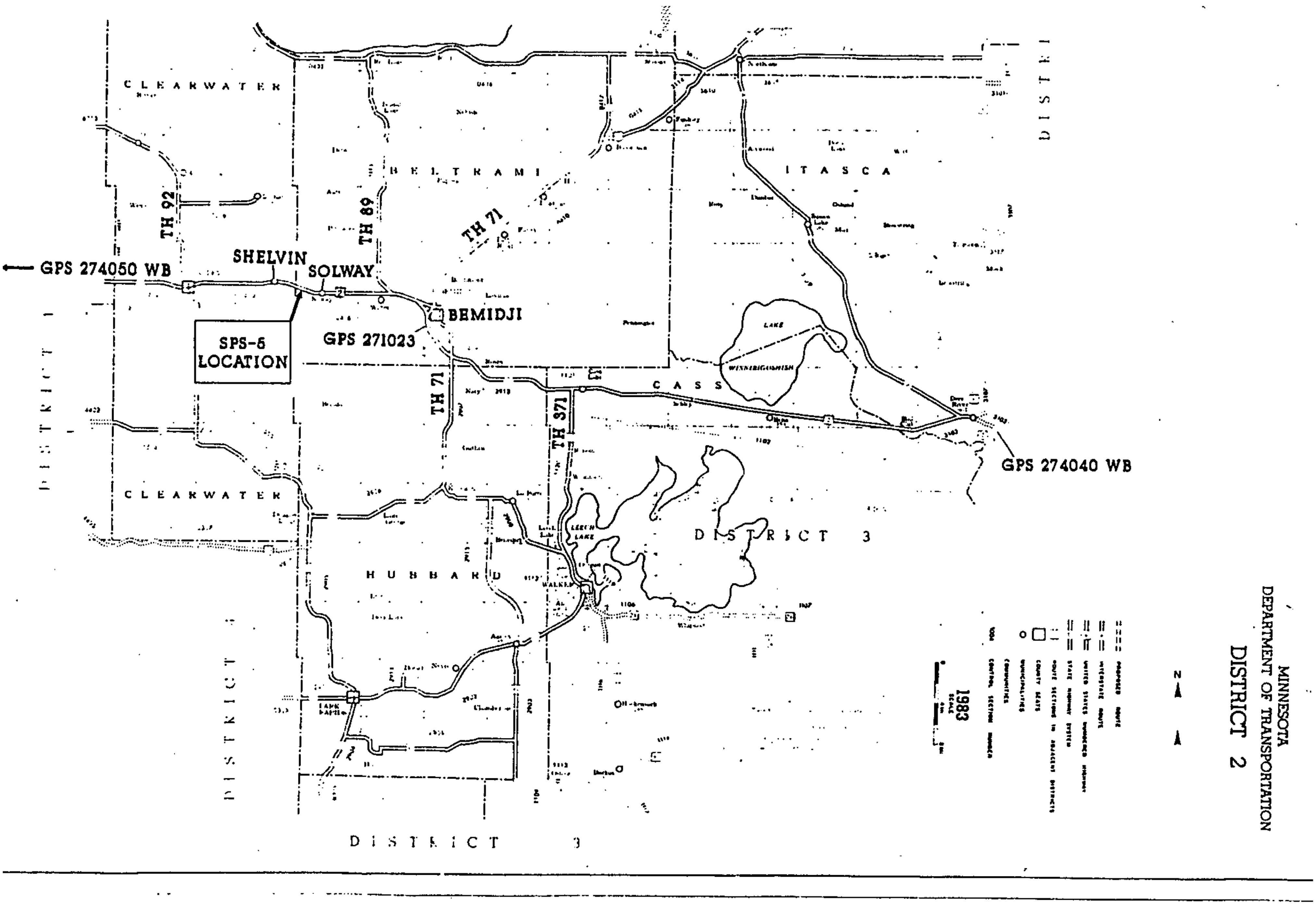
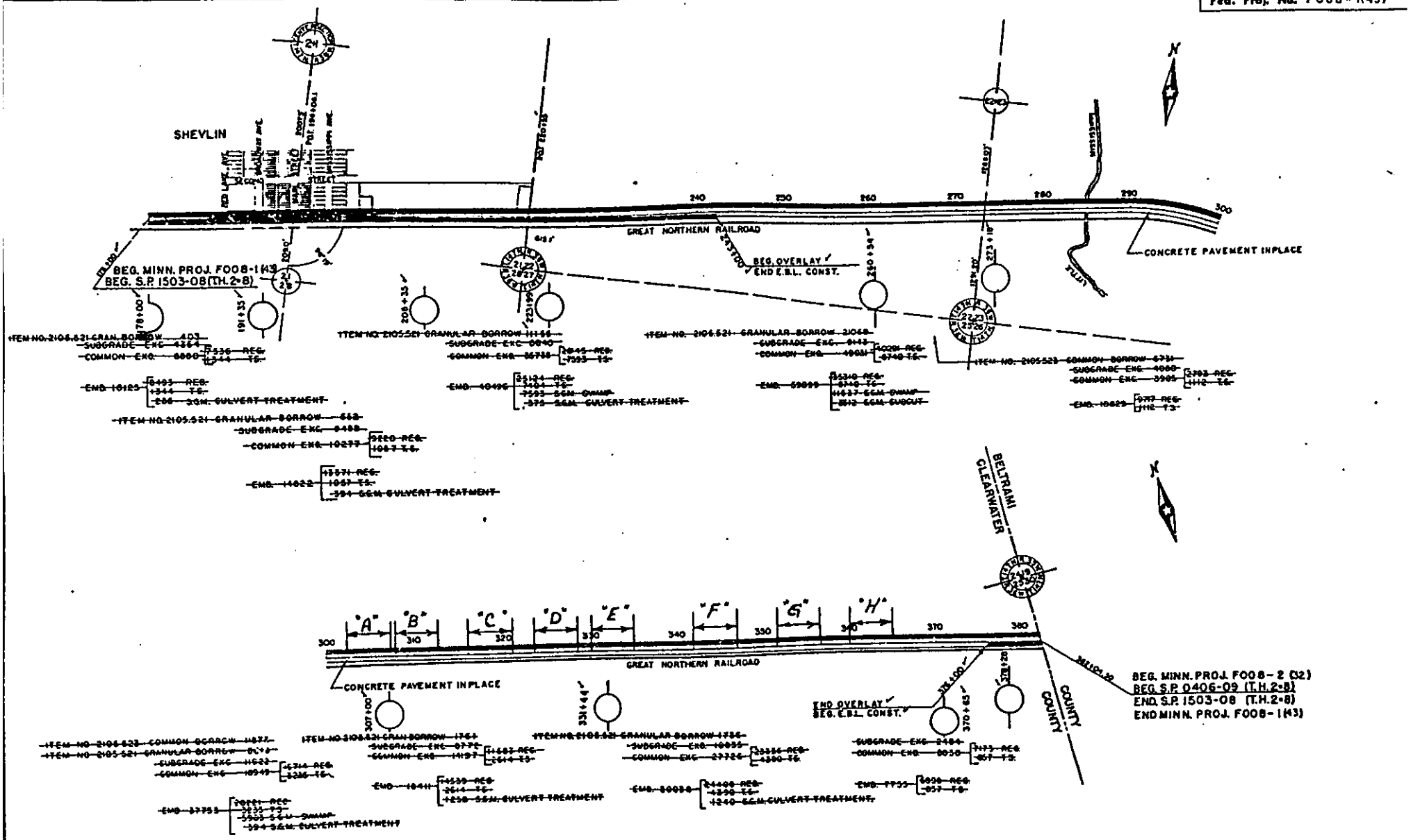


MINNESOTA
DEPARTMENT OF TRANSPORTATION
DISTRICT 2
1983
GPS 274050 WB
SHELVIN
SOLWAY
SPS-5 LOCATION
BEMIDJI
GPS 271023
GPS 274040 WB
TH 92
TH 89
TH 71
TH 371
CLEARWATER
BELTRAMI
ITASCA
CASS
HUBBARD
LAKE WINNIBIGOSHISH
LEECH LAKE
WALKER
DISTRICT 1
DISTRICT 3

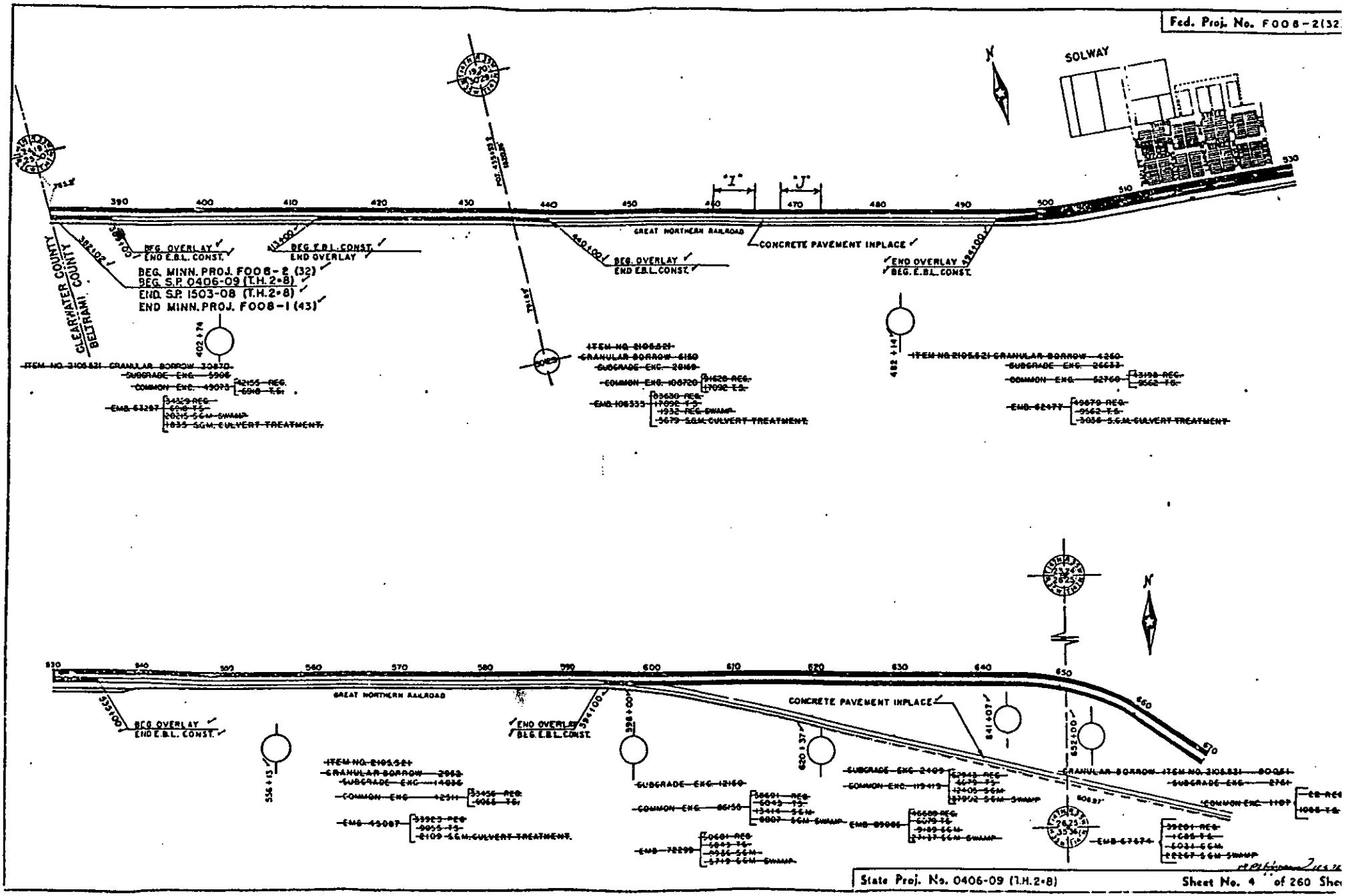
Fed. Proj. No. F008-1(43)



State Proj. No. 1503-08 (T.H. 2-8)

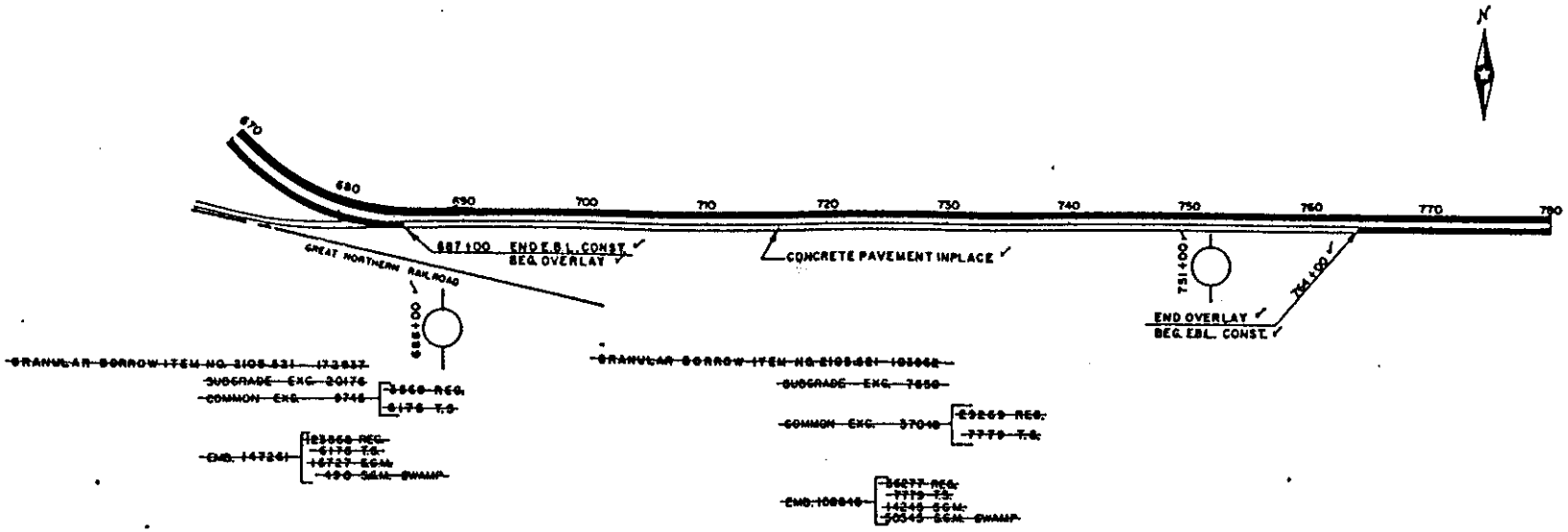
Sheet No. 3 of 260 Sheet

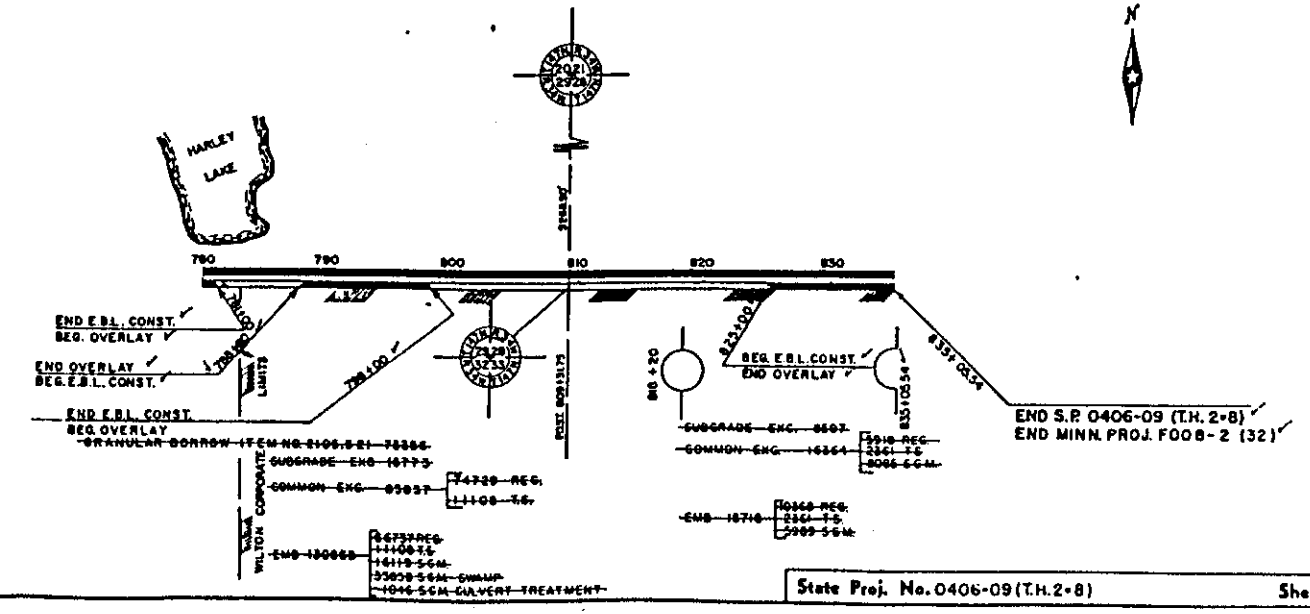
Fed. Proj. No. F008-2(32)



State Proj. No. 0406-09 (T.H. 2-8) Sheet No. 4 of 260 Sheets

Fed. Proj. No. F008-2(32)



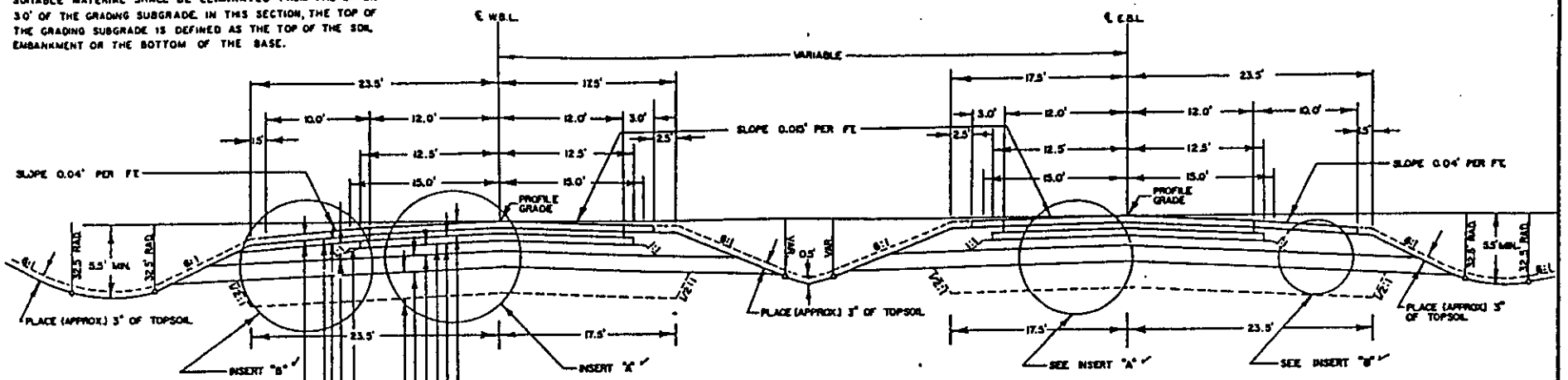


State Proj. No. 0406-09 (T.H. 2-8) Sheet No. 5 of 260 Sheets

Fed. Proj. No. F008-1(43)
F008-2(32)

SELECTED MATERIAL FOR GRADING FROM STATION 178+00 TO 598+00 SHALL INCLUDE ALL SOILS ENCOUNTERED EXCEPT TOPSOIL, PEAT, MUCK, OTHER ORGANIC SOILS AND DEBRIS. UNSUITABLE MATERIAL SHALL BE ELIMINATED FROM THE UPPER 3.0' OF THE GRADING SUBGRADE. IN THIS SECTION, THE TOP OF THE GRADING SUBGRADE IS DEFINED AS THE TOP OF THE SOIL EMBANKMENT OR THE BOTTOM OF THE BASE.

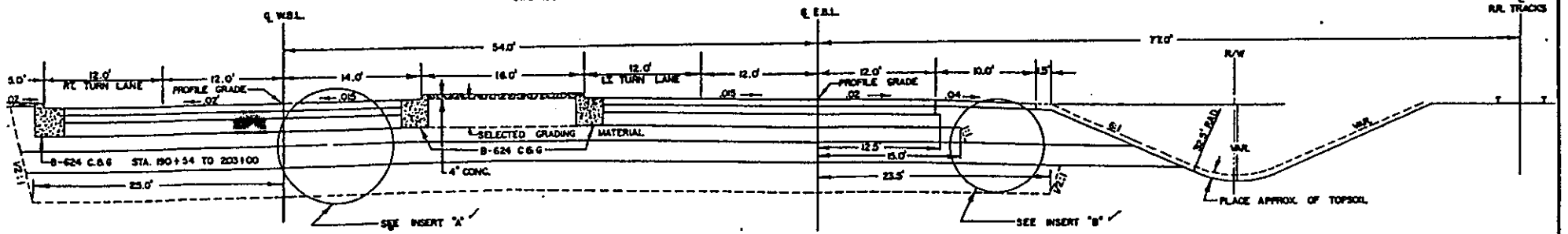
STA. 178+00 TO STA. 186+00
202+00 216+00



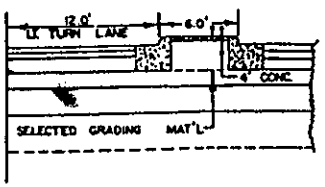
2" (APPROX.) SHOULDER MIXTURE – SPEC. 2331
ME COAT 0.5" BEYOND SURFACING
" AGGREGATE SHOULDERING-CLASS 5.
ARIABLE DEPTH AGGREGATE SHOULDERING-CLASS 3.
ECOND STAGE SHOULDER CONST.

3 1/2" PLANT-MIXED BITUMINOUS SURFACE – SPEC. 2341 MODIFIED
1 1/2" WEARING COURSE WITH 1% HYDRATED LIME
2" BINDER COURSE
3 1/2" BASE COURSE MIXTURE – SPEC. 2331
PENETRATION PRIME. 12½' WIDE (F) SHOULDERS ONLY
5" AGG. BASE CLASS 6.
12" AGGREGATE BASE – 6" CLASS 4, 6" CLASS 3
SUBGRADE CORRECTION OR COMPACTION CUT (BACKFILL WITH SELECTED GRADING MATERIAL) – EXCEPTION: SELECTED GRANULAR BACKFILL AT THE FOLLOWING LOCATIONS:
STA. 289+00 TO 290+00
STA. 234+00 TO 241+00

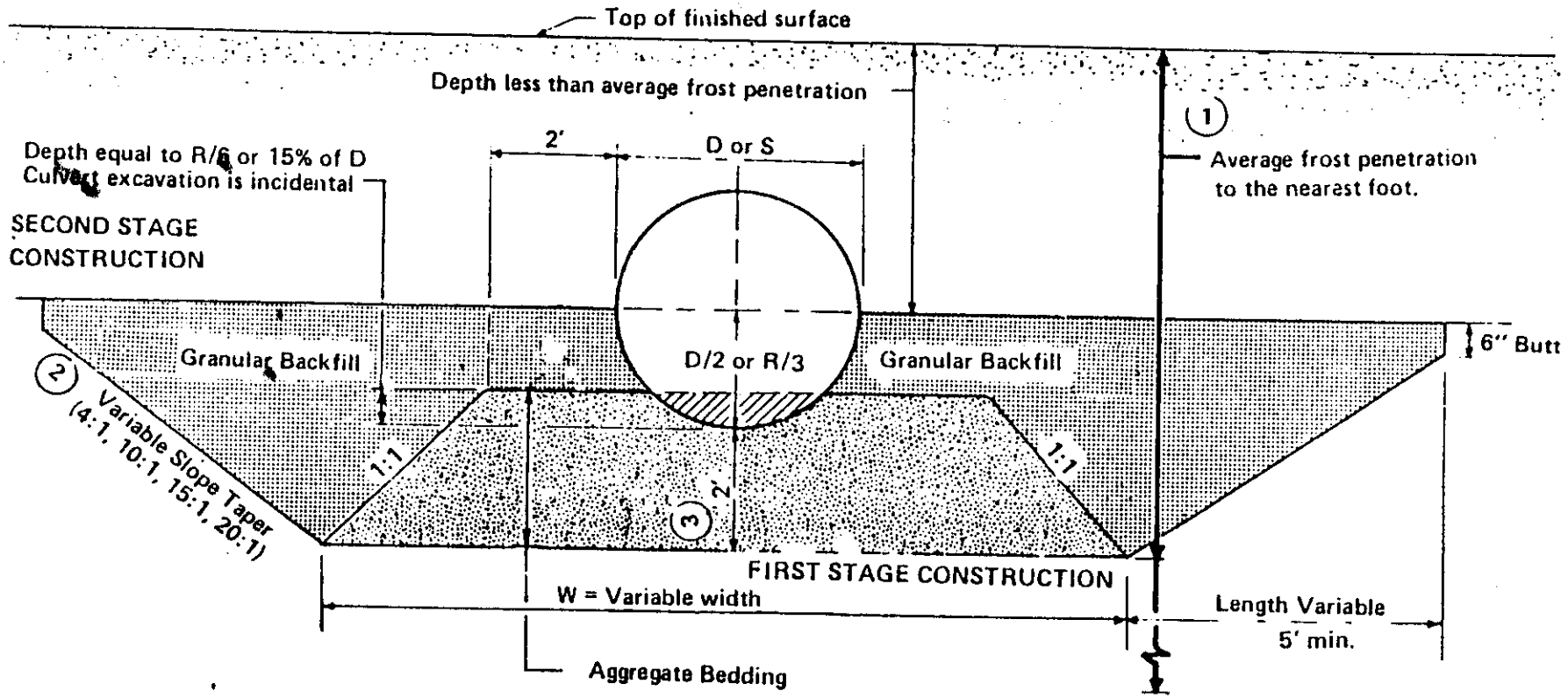
STA. 186+00 TO STA. 202+00



– CONSTRUCT 4" CONCRETE WALK STA. 190+56 TO 203+00



State Proj. No. 1503-08 & 0406-09 (TH 2+8) Sheet No. 6 of 260 Sheets



LEGEND:
D = Outside diameter of round pipe
R = Outside rise of pipe-arch
S = Outside span of pipe-arch

(1) Average frost depth will be determined by the Soils Engineer
(2) Taper ratio depends on soil and moisture condition. Taper to be used will be recommended by Soils Engineer.
(3) Depth shall be 2 feet unless recommended deeper by Soils Engineer

NOTES:

1. Excavation will be paid for as Subgrade Excavation (MHD 2105)
2. MHD Spec. 2451 shall apply to bedding and backfill construction
3. All granular material items are to be measured on the basis of compacted volume (CV).

NOTE: See Case IV Tables 5-292.514, Case IV Tables 5-292.515 & Case IV Tables 5-292.516 for cubic yards of backfill required per lineal foot.

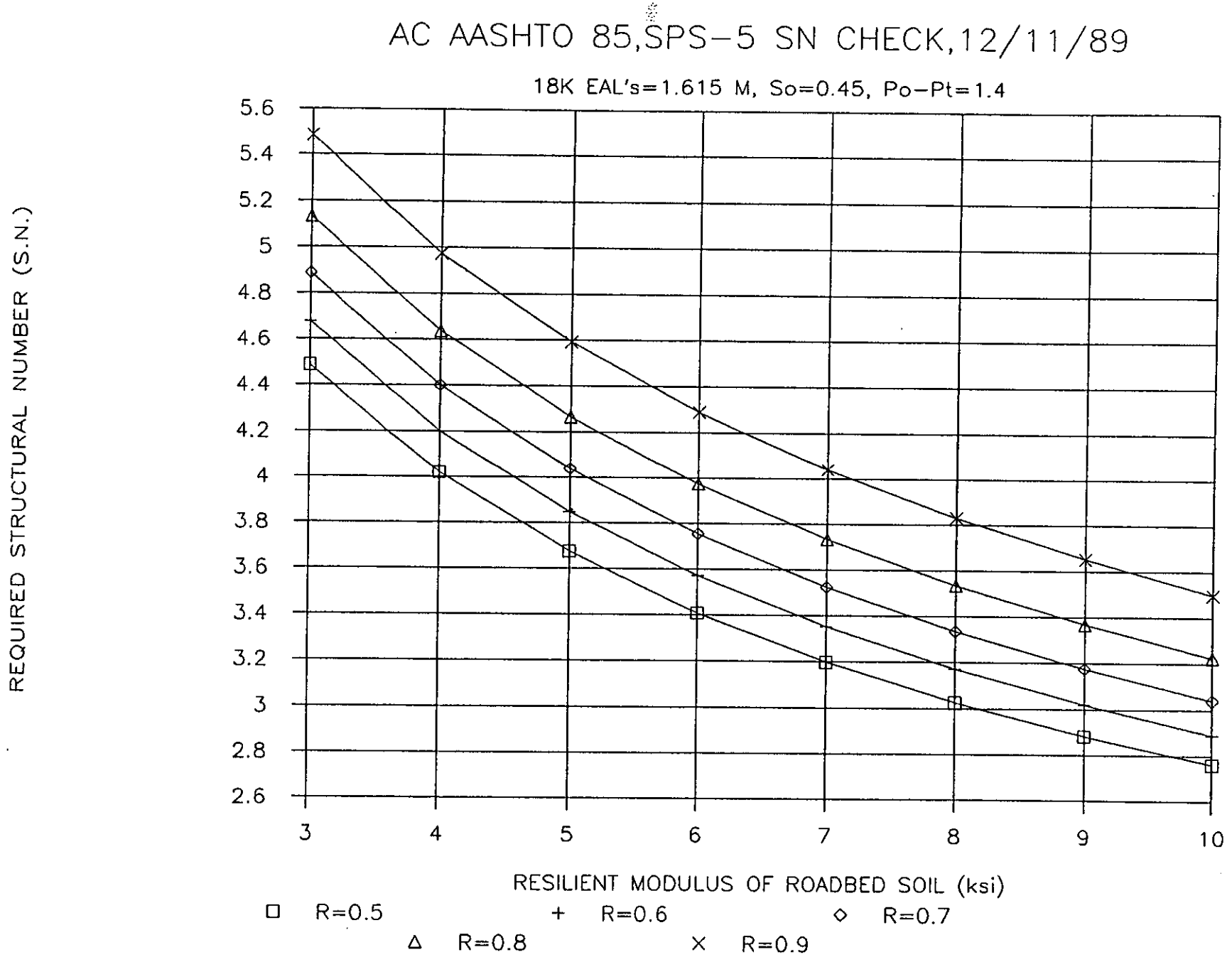
TREATMENT OF CENTER-LINE CULVERTS IN PLASTIC SOILS

WHERE FROST DEPTH IS BELOW THE FIRST STAGE CONSTRUCTION BASE

CASE IV

TABLE 1. SPS-5 sections on T.H. 2 near Bemidji.

			- Tentative Treatment -			Distresses observed during initial survey								
						Allig.		Raveling						
	SECT.		O.L.	Mix.	Surf.	Cr.	Patch	Weathering	Trans. Cr.			Avg.		
Sec.	NO.	Stationing	(in.)	Type	Prep.	L-sev.	L-sev.	L-sev.	L	M	H	Space	Bleeding	Rut Depth
A	3	302+25 - 307+25	5.0	Recycle	Minimum	5	-	2000	21	13	-	14.7	750	0.5+
B	8	307+75 - 312+75	5.0	Recycle	Intensive	-	-	1750	26	7	-	15.2	1250	0.5
C	2	316+00 - 321+00	2.0	Recycle	Minimum	-	-	2000	15	10	-	20.0	1250	0.5
D	9	323+50 - 328+50	2.0	Recycle	Intensive	-	-	2500	21	7	-	17.9	500	0.5
E	5	330+00 - 335+00	2.0	Virgin	Minimum	5	-	3000	21	13	-	14.7	1000	0.5
F	6	342+00 - 347+00	2.0	Virgin	Intensive	20	-	2500	17	19	2	13.2	500	0.5
G	4	351+50 - 356+50	5.0	Virgin	Minimum	207	1	3000	17	13	9	12.8	1000	0.5+
H	7	360+00 - 365+00	5.0	Virgin	Intensive	30	-	3000	14	16	6	13.9	1500	0.5
I	1	460+00 - 465+00		None	None	-	-	5000	32	3	-	14.3	1000	0.5+
J	10	468+00 - 473+00	1.5	Project	Project	-	-	5000	18	6	1	20.0	500	0.5+


AC AASHTO 85,SPS-5 SN CHECK,12/11/89
18K EAL's=1.615 M, So=0.45, Po-Pt=1.4
REQUIRED STRUCTURAL NUMBER (S.N.)
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
3
4
5
6
7
8
9
10
RESILIENT MODULUS OF ROADBED SOIL (ksi)
R=0.5
R=0.6
R=0.7
R=0.8
R=0.9

Minnesota Department of Transportation
Transportation Building, St. Paul, MN 55155

MINNESOTA 1990

September 19, 1989

Mr. Amir N. Hanna
Strategic Highway Research Program
SPS Site Nominations
818 Connecticut Avenue, N.W.
Washington, D.C. 20006

Dear Mr. Hanna:

Enclosed is your form, "Nomination of Test Sites for SPS-5 Rehabilitation of Asphalt Concrete Pavements", completed for our candidate site. This site is included in a project scheduled for construction in early 1990.

Because of the lead time necessary to include the SPS-5 requirements in the design plans, it is important that we know as soon as possible whether this site has been selected by SHRP.

I apologize for the length of time it has taken for Mn/DOT to submit a candidate, but the SPS requirements necessitated a very extensive search for a viable site. We have not been able to identify a SPS-6 candidate site at this time, but we continue to search.

If there are any questions or comments, please do not hesitate to call.

Sincerely,

Fred V. Maurer
Pavement Management Operations
Supervisor

Enclosure:

cc:
R. H. Sullivan
Eugene Skok

SHEET A. SPS-5 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

STATE Minnesota

PROJECT LOCATION

ROUTE NUMBER 2

ROUTE SIGNING [ ] Interstate [X] U.S. [ ] State [ ] County

Other _____

PROJECT LOCATION Start Milepost 94+00.8 End Milepost 107+00.3

Start Station 178+00 End Station 835+00

PROJECT LOCATION DESCRIPTION Between Shevlin and Wilton (Wilton is about 6 miles West of Bemidji)

COUNTY Beltrami & Clear.

HIGHWAY AGENCY DISTRICT NUMBER 2

SHRP ENVIRONMENTAL ZONE

[X] WET FREEZE [ ] WET NO-FREEZE [ ] DRY FREEZE [ ] DRY NO-FREEZE

SIGNIFICANT DATES

LATEST DATE OF APPROVAL NOTIFICATION FROM SHRP _____

CONTRACT LETTING DATE May 25, 1990

ESTIMATED CONSTRUCTION START DATE July 1, 1990

PROJECT DESCRIPTION

YEAR OPENED TO TRAFFIC 1970

NUMBER OF LANES (One Direction) 2

[X] Divided [ ] Undivided

OUTSIDE LANE WIDTH (Feet) 12

OUTSIDE SHOULDER TYPE

[ ] Turf [ ] Granular [X] Asphalt Concrete [ ] Surface Treatment

[ ] PCC [ ] Curb and Gutter Other _____

OUTSIDE SHOULDER WIDTH (Feet) 10

SUBSURFACE EDGE DRAINS [ ] Placed at initial construction [X] Not Used

[ ] Retrofitted Retrofit Date _____

ASSESSMENT OF PRESENT PAVEMENT CONDITION [X] Fair [ ] Poor

PREDOMINATE DISTRESSES

[ ] Fatigue Cracking [ ] Other Cracking [ ] Potholes/Patches [ ] Rutting

Comments Transverse Cracking

SHEET B. SPS-5 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

STATE Minnesota

PAVEMENT STRUCTURE LAYER DESCRIPTIONS

LAYER[1] NO.	LAYER[2] DESCRIPTION CODE	MATERIAL TYPE[3] CLASS CODE	THICKNESS[4] (INCHES)	STRUCTURAL[5] COEFFICIENT	
1	SUBGRADE (7)				
2	06		12.0	0.09	0.7
3	05		6.0	0.14	1.0
4	04		5.5	0.36	2.0
5	03		1.5	0.44	2.2
6				0.	
7				0.	
8				0.	
9				0.	

NOTES

1. Layer 1 is the natural occurring subgrade soil. The existing surface will have the largest assigned layer number.

2. Layer description codes:

Overlay 01	Base Layer 05	Porous Friction Course . 09
Seal Coat 02	Subbase Layer 06	Surface Treatment 10
Original Surface . 03	Subgrade 07	Embankment (Fill) 11
Subsurface HMAC .. 04	Interlayer 08	

3. Refer to Tables 1 through 4 for material class codes.

4. If subgrade depth to a rigid layer is known, enter this depth for subgrade, otherwise leave blank for subgrade layer.

5. Enter AASHTO structural layer coefficient used in pavement design or typical coefficient used by agency for this material. For the subgrade, enter either AASHTO soil support value or estimated resilient modulus.

SHEET C. SPS-5 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

STATE Minnesota

TRAFFIC DATA

ANNUAL AVERAGE DAILY TRAFFIC (TWO DIRECTION)	
% HEAVY TRUCKS AND COMBINATIONS (OF AADT) 290 West Bound	
COUNT YEAR OF AADT ESTIMATE	
TRAFFIC GROWTH RATE SINCE PROJECT OPENED TO TRAFFIC (%/YR)	
18K ESAL RATE IN PROPOSED STUDY LANE (1,000 ESAL/YR)	85
YEAR OF ESAL RATE ESTIMATE	1989
ESTIMATED TOTAL 18K ESAL APPLICATIONS IN STUDY LANE[1]	1,615,000

REHABILITATION INFORMATION[2]

PRIMARY CAUSE FOR REHABILITATION Low condition ratings between reference pts 92 and 102 and an interest in protecting the investment of this important E-W arterial.

OVERLAY	Thickness (Inches)	Material Type Class Code
Surface Course	1.5	01
Binder Course	—	—

SURFACE PREPARATION PRIOR TO OVERLAY

[] Patching [] Crack Sealing [] Milling Depth of Mill _____

Other Tight blading. A fine mix placed and spread with a motor grader. The mold board is tilted forward to force the mix down as with a squeege.

OTHER CONSTRUCTION ACTIVITIES TO BE PERFORMED DURING REHABILITATION

NOTES

1. Leave blank if estimate is not available.
2. This information concerns the planned rehabilitation work to be performed by the agency on the non-experimental portions of the project.

SHEET D. SPS-5 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

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TEST SECTION LAYOUT

NUMBER OF TEST SECTIONS ENTIRELY ON: FILL 9 CUT 1 (a)

SHORTEST TRANSITION BETWEEN CONSECUTIVE TEST SECTIONS (Feet) 50 (b)

COMMENTS ON DEVIATIONS FROM DESIRED SITE LOCATION CRITERIA

(a) This project has very shallow cuts and fills. A 2-3 foot compaction and cut was used in the cut area. The cut is Section "H" which is proposed for 5" Virgin Intensive.

(b) A 50 foot space between Sections "A" & "B" is necessary to avoid culverts. The proposed treatments are: "A" - 5" Recycle - Minimum
"B" - 5" Recycle - Maximum

OTHER SHRP TEST SECTIONS

DOES PROJECT CONFORM TO GPS-1 OR GPS-2 PROJECT CRITERIA?	[X] YES	[ ] NO GPS 1-
DOES AGENCY APPLIED TREATMENT QUALIFY FOR GPS-6B?	[X] YES	[ ] NO GPS 6B
IS PROJECT SUITABLE FOR SPS-3 TEST SECTIONS?	[ ] YES	[X] NO
IS AGENCY INTERESTED IN USE OF PROJECT AS SPS-3 SITE?	[ ] YES	[X] NO

DISTANCE TO NEAREST GPS TEST SECTION ON SAME ROUTE (Miles) ~ 12

TEST SECTION NUMBER OF NEAREST GPS SECTION 271023

SUPPLEMENTAL TEST SECTIONS

IF SUPPLEMENTAL EXPERIMENTAL TEST SECTIONS ARE PROPOSED, COMPLETE THE FOLLOWING

TOTAL NUMBER OF SUPPLEMENTAL TEST SECTIONS 2

FACTORS TO BE INVESTIGATED

(1) Tight-blading leveling and 1.5" overlay

(2) Mill and repair transverse cracks and 1.5" overlay or mill entire section and overlay

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